Simultaneous separation and identification of bisphenol analogues by capillary electrophoresis

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INTRODUCTION

Bisphenol

- Bisphenols are a group of compounds containing two hydroxyphenyl groups joined together by differently substituted bridging atom

BPA

- Base chemical in polycarbonate plastic production
- Found to leach out in acidic, basic and most environmental matrixes
- BPA is an endocrine disrupting chemical
- Commercialization of BPA-free products via substitution of BPA with its analogues

Bisphenol Analogues

- Certain analogues have nearly identical endocrine disrupting effects (BPS and BPF)
- Other analogues cause concern due to their unstudied effects on health and the environment

Figure 1. BPA free product labels.

OBJECTIVE

To develop a method to separate and identify bisphenol analogues using capillary electrophoresis (CE)

CAPILLARY ELECTROPHORESIS (CE)

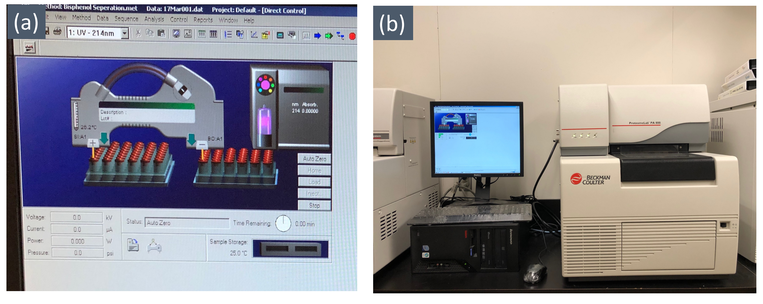
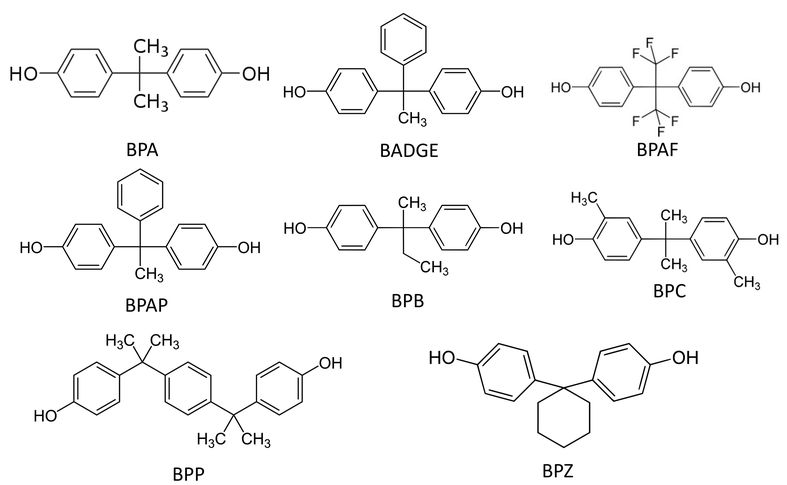


Figure 2. A Beckman P/ACE MDQ CE instrument with an ultraviolet (UV) detector was used. (a) instrumental control screen. (b) CE instrument

Table 1. Instrumental parameters.

Detection Wavelength	215 nm
Applied Voltage	15 kV
Separation Time	15 min
Separation Buffer	20 mM borate buffer pH 10

BISPHENOL ANALOGUES



RESULTS

Table 2. Migration times for bisphenol standards

Graph Colour	Standard	Migration Time (min)
Light purple	BPA	3.508
Orange	BPB	3.408
Navy	BPC	4.438
Light green	BPAF	4.746
Purple	BPAP	3.450
Light blue	BPZ	3.125
Dark green	BADGE	2.579

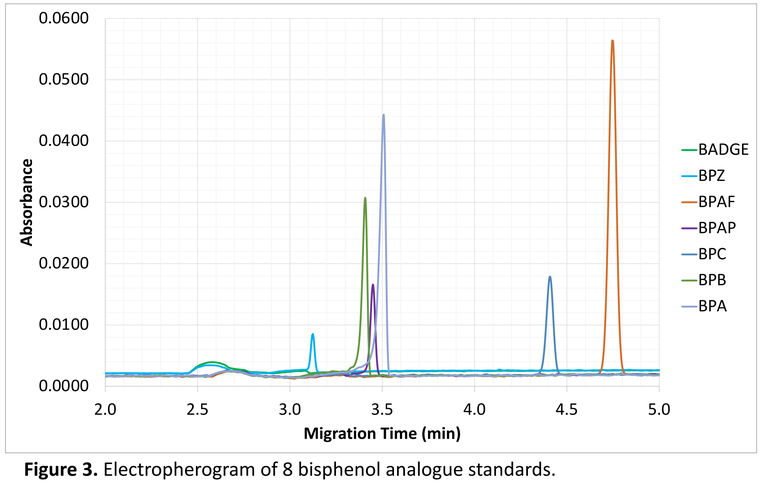


Figure 3. Electropherogram of 8 bisphenol analogue standards.

RESULTS

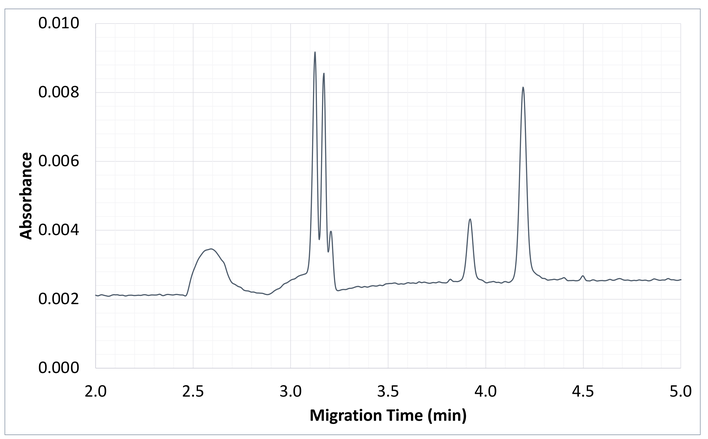


Figure 4. Electropherogram of bisphenol mix containing 8 bisphenol analogue standards.

Identity of peaks

In order of migration time (first to last): BADGE, BPZ, BPB and/or BPAP, BPA, BPC, BPAF

CONCLUSIONS AND FUTURE WORK

Conclusions

- Separation of 5 bisphenol analogues was achieved
- Peaks were identified by migration time of the individual standards
- BPAP and BPB did not fully resolve in the bisphenol mix sample

Future work

- Optimize separation
- Run spiked samples to confirm identify the peaks
- Investigate large volume sample stacking (LVSS) to improve detection limit
- The developed method can be coupled with extraction methods of suspected bisphenol-containing products to identify the analogues present.

This method can become a valuable resource in monitoring bisphenol contamination in food and the environment.

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